5.—A SURVEY OF THE ONISCOID GENUS PHALLONISCUS BUDDE-LUND, WITH A DESCRIPTION OF NEW SPECIES.

by

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I.—INTRODUCTION.

During a number of years there has been accumulating in the collection of the Biology Department of the University of Western Australia a large amount of material of the Terrestrial Isopods. Recently, at the suggestion of Professor G. E. Nicholls—to whom the author wishes to express her sincere thanks for much helpful advice and criticism during the course of the investigation—an examination and report upon this material was undertaken.

At a very early stage it became evident that considerable confusion existed in relation to the species grouped together under the genus *Phalloniscus*, and further material was sought from New Zealand and elsewhere. Finally, it was apparent that this confusion could not be cleared up without reference to material reported upon by Budde-Lund, Chilton and Wahrberg. Through the courtesy of the Curators of the Museums of Hamburg, Stockholm, Western Australia, Sydney and Canterbury (New Zealand) these specimens were made available, and it is now evident that Budde-Lund's genus *Hanoniscus* is scarcely separable from his earlier genus *Phalloniscus*. It has been considered desirable, however, to retain it as a sub-genus to include the Western Australian Phalloniscids which, differing from Wahrberg, the author regards as specifically distinct from those recorded from New Zealand.

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II.—THE GENUS, *PHALLONISCUS* BUDDE-LUND.

The genus is of considerable interest in view of its geographical distribution. Originally, it was erected by Budde-Lund (1908, p. 296) to receive two New Zealand species *Oniscus punctatus* G.M.T. and *O. kenepurensis* Chilt., a species recorded by Dollfus, from Chile, under the name *Philoscia anomala* and two undescribed species.[1] Its range was subsequently found to be much more extensive when Wahrberg (1922) recorded its occurrence in Western Australia, referring his forms to the New Zealand species.

Unfortunately, the original description of the first named New Zealand species *Ph. punctatus* (Thomson, 1879) was very brief, and did not include a description of the mouth parts. Later, examples referred to the latter species were collected from Mt. Wellington, Tasmania (1892), and in recording their occurrence Thomson then gave a short account of the mouth parts; but, following the lines usual at that time, omitted certain of the details now regarded as essential. Moreover, it is by no means certain that his material from Tasmania was identical with the New Zealand *Ph. punctatus* as was subsequently pointed out by Chilton (1901).[2]

The second New Zealand species was not obtained until 1901, and was then described by Chilton, who followed Thomson in referring it to the genus *Oniscus*. In the same paper Chilton gives further details concerning *Ph. punctatus*, notes its wide distribution throughout New Zealand, refers to its variability of form, and remarks that more than one variety is included in the species. Chilton (1901) realized that *Ph. punctatus* differed markedly from the definition of *Oniscus* as given both by Budde-Lund and Sars in that the mandibles did not bear so many "penicils" behind the cutting-edge.

Wahrberg devotes considerable space to a discussion of the generic characters of Budde-Lund's genus, since the latter considered it to be closely related to the genus *Alloniscus* Dana, whereas Wahrberg viewed it as a more specialised genus forming to some extent a connecting link between *Oniscus* and *Philoscia*.

For the Western Australian species he described the mouth parts, but figured only the maxillipeds. In the absence of an exact description of the mouth parts of the named species of this genus, he failed to appreciate the fact that quite considerable differences actually existed between the Western Australian and New Zealand forms. He directed attention, however, to what appeared to be a useful character for systematic purposes, viz., the form of the scale-setae.

Only quite recently has there been published a really detailed account of a *Phallonisc*us species. This we owe to Monod (1931), who figured a New Zealand form which he identified with some hesitation as *Ph. punctatus* (G.M.T.). Monod points out that the scale-setae of his New Zealand (Stewart Island) specimens are remarkably unlike those figured by Wahrberg, and suggests that the Western Australian species *Ph. punctatus* would probably prove distinct if, indeed, it ought not to be referred to a new genus.

1. I have been unable to find any further reference to these species.
2. It is noteworthy that Thomson described and figured the inner lobe of the first maxilla as ending in "five weak slightly curved teeth" whereas in all other known Oniscoids this lobe is furnished with plumose setae and not teeth. This, if correct, would establish the distinctness of the Tasmanian species.

There can be no doubt that Monod's suggestion is well founded. The examination of the very extensive collection available here has made it evident that actually no fewer than three species, all distinct from those recorded from New Zealand, are to be found in Western Australia. At first it was impossible to decide whether any of these were to be identified with those named by Wahrberg, for his account, while sufficient to show that his species are closely related to the species in the University collection, nevertheless, omits some of the detail essential for their identification.

The determination of these species was hampered by the vagueness which characterised some of the earlier accounts, and further by the fact that the descriptions of the scale-setae by Wahrberg and Monod appear discordant. It seemed possible, however, that this discrepancy might be due to the chance that the scale-setae figured by these authors had been taken from different regions. In the hope of determining to what extent the scale-setae were actually distinct, an appeal was made to Professor Percival, of Canterbury, Christchurch, for named New Zealand material, and two specimens apiece of *Oniscoids*, identified by Chilton as *Ph. punctatus* (from Auckland Island) and *Ph. kenepurensis* (from Stephens Island) were kindly sent. A study of these had unexpected results, for the specimens labelled *Ph. punctatus* were found to differ in an important character from any named form, and made unavoidable the recognition of these as a new species (*Ph. chiltoni*).

The examination did, however, serve to clear up the question of scale-setae, and established that the Western Australian specimens are most certainly not referable to either of the New Zealand species, and almost justified Monod's prediction that generic separation might be necessary. It had been decided to segregate these in a new sub-genus of *Phalloniscus*, and this paper was almost completed when a specimen in the collection of the Western Australian Museum, collected by Michaelsen and Hartmeyer, at York, in 1905, came to the author's notice. The tube containing the specimen has several labels. One of these, possibly in Budde-Lund's handwriting, is inscribed *Harroniscus tuberculatus*, York 11/8:05. A second, presumably the Hamburg Museum label, records the name as "*Hanoniscus tuberculatus*, B.-L. (Type!)," whilst the third, the official label of the Western Australian Museum, reads "7166, Isopoda, *Harroniscus tuberculatus*, BL. TYPE, York, Hamburg Exp." Budde-Lund's account (F.S.W., 1912, vol. 4, p. 42), which was left incomplete at his death, records specimens from several localities, including a single specimen from York, which is presumably the specimen in question. It was undissected, and there can be little doubt that it was referred to this species on external appearance, but, as events proved, it was an erroneous identification. By the courtesy of Mr. L. Glauert, Curator of the Western Australian Museum, the author was allowed to examine the specimen, and found that it bore a strong superficial resemblance to a species abundant in the University Collection of Terrestrial Isopods, and which had definitely proved to be *Phalloniscus* and provisionally named *Phalloniscus monodi* n. sp. Partial dissection revealed its complete agreement with that species, except for trivial differences in the condition of the maxilliped in both endite and endopodite. Surprisingly, however, it differed essentially from the figures of *Hanoniscus tuberculatus* furnished by Budde-Lund (op. cit., Taf. 1, figs. 14-20, and text fig. 26) in the form of the outer lobe of maxilla 1, the endite of the maxilliped and in the number of penicils in the left mandible. It was plain, therefore, that at

least two distinct species had been included under the name *Hanoniscus tuberculatus*, of which the specimen in the Western Australian Museum could not be the type. Nevertheless, the fact that Budde-Lund could confuse a species of *Phalloniscus* with another which he referred to the genus *Hanoniscus* (unfortunately undescribed) raised the question as to whether the latter might not prove to be identical with *Phalloniscus*. The matter was further complicated by the fact that not only was *Hanoniscus* undescribed, but that three species had been referred to it, and of two of these neither figures nor description existed.

It was also remarkable that no specimens referable to *Hanoniscus tuberculatus*, as figured by Budde-Lund, were represented in the University collection. With a view to clearing up the relationship of the two genera, an appeal was made to the Hamburg and Stockholm Museums for the material of *Phalloniscus* (as identified by Wahrberg) and *Hanoniscus*.

III.—LIST OF MATERIAL EXAMINED BY BUDDE-LUND AND WAHRBERG.

1. *Phalloniscus punctatus* (Thoms). (2 specimens) collected by Chilton from Canterbury and identified by Budde-Lund.

2. 2 specimens, collected by Michaelsen (1905) from Dongarra and referred by Wahrberg to *Phalloniscus punctatus* (G.M.T.).

3. 2 specimens, collected by Michaelsen (1905) from Perth and referred by Wahrberg to *Phalloniscus kenepurensis* (Chilt.).

4. *Hanoniscus tuberculatus* B-L. (5 specimens) collected by Michaelsen from Cannington (1905) and identified by Budde-Lund.

5. *Hanoniscus* sp. (6 specimens) collected by Michaelsen (1905) from Moora.

6. *Hanoniscus* sp. (5 specimens) collected by Michaelsen (1905) from Bunbury.

7. *Hanoniscus tuberculatus* (1 specimen) collected by Michaelsen (1905) from York and identified by Budde-Lund. This is labelled type, but as before-mentioned, it was undissected and did not correspond with Budde-Lund's figures.

IV.—DIAGNOSIS OF PHALLONISCUS.

The genus was originally instituted by Budde-Lund (1908) in a paper which was not available here. In a paper published in 1909 Chilton stated that Budde-Lund had indicated by letter that he was instituting a new genus to receive *Oniscus punctatus* but remarked that he was not aware of its publication. Wahrberg (1922) erroneously attributes the genus to an earlier (1904) date and in a rather indefinite way enlarges the generic diagnosis, but, as Monod points out, this contribution has complicated rather than clarified the matter.

Through the kindness of Dr. Calman, of the British Museum, a copy of the original diagnosis was received. This is as follows:—

"Ausser obenerwähnter Gattung *Niambia*, die Verwandschaft mit *Alloniscus* zeigt, scheinen die in New-Zealand vorkommenden Arten von *Oniscus*, *O. punctatus* Thoms und *O. kenepurensis* Chilton, mit *Alloniscus* verwandt zu sein und stehen von der Gattung *Oniscus* mehr entfernt. Ich

fasse diese Arten, wozu noch zwei unbeschriebene kommen, in einem neuen Gattung *Phalloniscus* zusammen. Hierher gehört auch *Philoscia anomala* Dollf. von Chile.

"Während *Niambia* zweigleiderige Antennengeissel hat, ist die Geissel bei *Phalloniscus* wie bei *Alloniscus* dreigliedering. Die Mandibeln haben in allen drei Gattungen nur einen "freien" pinselförmigen Anhang. Bei *Phalloniscus* ist die Mala der Maxillipeden mit Dornen in der Spitze besetzt, während *Niambia* nur einen Dorn hat und *Alloniscus* einen Anhang. Sehr übereinstimmend mit *Alloniscus* ist rücksichtlich der Form der Innenäste der Pleopoden des ersten Paares beim Männchen die stark entwickelt sind, und noch mehr klumpig als in *Alloniscus* enden."

It has become evident that Wahrberg was undoubtedy in error in assigning his Western Australian material to the New Zealand species *Ph. punctatus* and *Ph. kenepurensis* so that it is a question how far his modification of the diagnosis can be accepted. Indeed, so different is the character of the scale-setae in the New Zealand specimens from that of the Western Australian forms that a reliance upon this character as of generic importance would necessitate a new genus for the Western Australian forms. It has been decided to retain the three Western Australian species in the genus, this determination being fortified by the fact that in a similar case (*Exzaes*), Barnard (1932) has considered such differences no bar to congeneric grouping. From a consideration of characters other than scale-setae, however, it seems desirable to place them in a distinct sub-genus.

The generic diagnosis (based on a study of material from New Zealand and Western Australia and on descriptions and figures given by Thomson, Chilton, Wahrberg and Monod) may be set out as follows:—

Genus PHALLONISCUS Budde-Lund 1908.

1908. Budde-Lund, Isop. Madagaskar und Ostafrika, in Voeltzkow, Reise, Band II., p. 296.

1922. Wahrberg, Ark. Zool., XV., p. 86.

Body, oblong-oval. Cephalon of "discrete" type and with lateral lobes. Mesosome with side plates moderately expanded and posterior margins of anterior segments almost straight. Metasome, not abruptly narrower than the mesosome though tapering away strongly; epimera of metasomatic segments 3-5 well developed, narrow and ending acutely; terminal piece triangular in shape, being broader than long and bluntly rounded apically. Eyes moderate, lateral in position. Flagellum of second antennae, 3-jointed. Mandibles with one (or two) "free" penicils; molar penicil represented by a tuft of plumose setae. Maxilla 1, outer lobe, with the fifth inner tooth simple; inner lobe with spine. Maxilliped, endite with 1 spine and 3 teeth; second joint of endopodite with 2 tufts of setae on inner margin, third joint with apical tuft. Pleopods conspicuous, with well developed opercular plates lacking air cavities. Uropods exposed, moderately developed; outer margin of peduncle grooved; inner ramus arising slightly anteriorly to outer.

As noted, the Western Australian species, as a group, differ in a number of minor characters from the New Zealand species and it seems desirable to set them apart in a sub-genus for which the name *Hanoniscus*, proposed by Budde-Lund has prior claim.

V. Sub-genus HANONISCUS (Budde-Lund).

Lateral lobes of the head in the form of tubercles in front of the eyes. Supra-antennal line of cephalon interrupted between antennary sockets. Maxilla 2 with inner lobe only slightly smaller than outer; distal margin of outer lobe curved. In the endopodite of the maxilliped the setae in the b-position (Pl. V., fig. 8) arising directing from inner margin; endite with 3 extremely small teeth. Scale-setae dilated and rounded apically.

The details in which *Ph* (*Phalloniscus*) differs from *Ph.* (*Hanoniscus*) are shown in the following table:—

	Ph. (*Phalloniscus*).	*Ph.* (*Hanoniscus*).
Supra-antennal line of cephalon	Visible between antennary sockets	Interrupted between antennary sockets.
Maxilla 2	Inner lobe very much smaller than outer	Inner lobe only slightly smaller than outer
Maxilliped Palp	Setae in b-position numerous and borne on a prominence	Setae in b-position few and arising directly from inner margin
Maxilliped Endite	Distal margin with 3 prominent teeth	Distal margin with 3 extremely small teeth
Scale-setae	Tricuspid form	Dilated form

Remarks:

As previously mentioned, Budde-Lund (1908) expressed the view that the New Zealand species of *Phalloniscus* stood nearer to *Alloniscus* than to *Oniscus*. According to Wahrberg, who considered *Phalloniscus* as intermediate between *Oniscus* and *Philoscia*, primitive characters possessed by *Alloniscus* and not shared by *Phalloniscus* are:—

(1) The endite of the maxilliped which is without teeth or spines but provided with a feather-seta.

(2) The endopedite of the maxilliped which bears complete tufts of setae which become reduced to a few setae in the more specialised genera (e.g. *Philoscia*).

(3) The molar penicil of the mandible which originates from a comparatively broad base whereas, in more specialised genera, the basal part has become compressed.

Wahrberg adduced as further evidence of the intermediate position of *Phalloniscus* the condition of the porefields along the edges of the epimera and the types of exoskeleton. According to him, in *Philoscia* the pores are scattered along the entire length of the lateral border of the epimeron and the exoskeleton is thin and flexible and without granules; the scale sculpture poorly developed. He describes the pores as congregated into a central region along the lateral border of the epimeron in *Oniscus*, the exoskeleton as thick, brittle and granulated and the scale sculpture as well developed. In *Phalloniscus* the pores are found to be arranged in a fashion similar to that of *Oniscus* and the exoskeleton is with or without granules whilst the scale sculpture is well developed; exoskeleton moderately thick.

Other characters which may be cited in support of Wahrberg's view as to the intermediate position of *Phalloniscus* are to be found in the cephalon, mesosome and metasome. In *Oniscus* the cephalon is with well developed

lateral lobes. The lateral lobes are moderately well developed in the New Zealand forms of *Phalloniscus*, whilst in the Western Australian forms they are reduced to the form of prominent tubercles in front of the eyes. *Philoscia* is without lateral lobes. The mandibles are with 3-5 "free" penicils in *Oniscus*, 1 (or sometimes 2) in *Phalloniscus*, and with but 1 in *Philoscia*. The posterior margins of the anterior segments are deeply sinuous in *Oniscus*, whereas in *Phalloniscus* and *Philoscia* they are almost straight. In *Oniscus* the epimera of the metasome are well developed so that the metasome is not sharply marked off from the mesosome. The epimera are moderately developed in *Phalloniscus*, the mesosome being scarcely narrowed. In *Philoscia* the metasome is very abruptly narrowed, the epimera sometimes not being visible from above.

The more important of these characters may be conveniently set out in tabular form.

	Oniscus	*Phalloniscus*	*Philoscia*
Lateral lobes of cephalon	Well developed	Moderately developed	Absent
Mandibles ..	3-5 "free" penicils	1 (or 2) "free" penicil	1 "free" penicil
Posterior margins of anterior segments	Deeply sinuate	Almost straight	Almost straight
Metasome	Not narrowed	Not or very little narrowed	Narrowed

VI. DESCRIPTION OF SPECIES OF *PHALLONISCUS* BUDDE-LUND.

The material from Auckland Island identified by Chilton in 1909 as *O. punctatus* must be separated as a distinct species.

Phalloniscus chiltoni n. sp. (Pl. V., Figs. 1-19).

1909. *Oniscus punctatus*. Chilton, Subantarctic Is. of N.Z. (*non* G. M. Thomson).

Occurrence: Auckland Island.

Size: The larger male was 7.5 mms. in length and 3.8 mms. in width.

Colour: (Preserved specimens).

A light brownish background with a wide median band of a darker brown. The specimens are obviously very much faded.

Specific description.

Body (Pl. V., fig. 1), oblong-oval in shape, approximately twice as long as broad and moderately convex. Dorsal surface covered with conspicuous setae.

Cephalon (Pl. V., Fig. 2).

Wider than long. Frontal line not distinct in middle. Lateral lobes appear in front of the eyes as slightly raised crests. Profrons slightly bulbous, forming, when seen from above, an obtuse prominence. Marginal line forms hind margin of head and then passes obliquely across pleural portion of head to be joined just above the antennary tubercle by the supra-antennal line. Supra-antennal line distinct, sinuous. Antennary sockets distinct

from supra-antennal line. Postfrons with a rounded median prominence. Lateral processes of clypeus moderately large. Eyes laterally placed and consisting each of 18 ocelli.

Mesosome with the posterior margins of the first three segments very slightly sinuous and their posterior angles rectangular. Epimera of first segment produced anteriorly into rounded lobes extending a little in front of the posterior margins of the eyes. Lateral angles of the last four segments produced more and more backwards to end acutely; those of the seventh reaching to the middle of the epimeral portion of the third metasomatic segment.

Metasome a little more than one-third the length of the mesosome. Epimera of segments 3-5 well developed, narrow and recurved backwards. Epimera of the fifth metasomatic segment reach to the middle of the terminal piece. Terminal piece short and triangular in shape, being much broader than long. Apex rounded, reaching almost to the level of the distal margin of peduncle of uropod. Sides almost straight.

Appendages.

Antenna 1 consists of three joints, first joint broader and longer than second, third longer and narrower than second and bearing at apex and along the inner border a number of fairly stout setae.

Antenna 2 (Pl. V., fig. 3), fairly short and covered with short stout setae. First joint of peduncle short, second and third joints sub-equal in length, fourth longer than third, fifth approximately equals the length of the third and fourth combined. Flagellum equal in length to the fifth joint of peduncle and composed of three joints; first and second joints subequal, third equal to the first and second combined and followed by a styliform bristle almost as long as the first joint.

Right mandible with outer cutting edge strongly chitinised and composed of four teeth; inner cutting edge less strongly developed and divided into indefinite teeth; setose lappet beneath inner cutting edge with one penicil; two "free" penicils between setose lappet and molar penicil; molar penicil consisting of a tuft of plumose setae. Outer margin of mandible with a number of spines distally.

Left mandible (Pl. V., fig. 4) differs from right in that the inner cutting edge is more strongly chitinised and the setose lappet provided with two penicils.

Maxilla 1 with outer lobe (Pl. V., fig. 5) provided with 4+6 teeth-like projections and two short spines alongside the shortest of the outermost teeth; five of the inner teeth obsoletely denticulate, the fifth being simple; outer margin fringed distally with fine setae. Inner lobe (Pl. V., fig. 6) with two moderately long plumose setae and outer apical margin produced into a short spine-like projection.

Second maxilla (Pl. V., fig. 7) with outer lobe much broader than inner and covered apically with fine setae; its apical margin flattened. Inner lobe covered with groups of fine setae and provided along the margin with a row of stouter setae. At the junction of the lobes three still stouter setae occur.

Maxillipeds (Pl. V., fig. 8) long and narrow; epipodite more than three-quarters the length of basal joints; basipodite elongated, rectangular and

covered with short setae. Only first joint of endopodite distinct and provided with two stout spines; endopodite bears a tuft of setae in the a-position, a group in the b-position and a few in the c-position. Those in the b-position are borne at the apex of a prominence, whilst those in the c-position arise directly from the inner margin. Endite truncate, with one spine and three conspicuous teeth, one towards the inner margin and two towards the outer; outermost tooth strongly curved; inner surface with a group of stout setae.

Peraeopods (male). Merus and carpus of anterior legs with spinous-setae of the type figured (Pl. V., fig. 9); dactyls (Pl. V., fig. 10) slender, biunguiculate and with simple dactylar seta. Peraeopods show slight progressive increase in length.

Pleopods (male) (Pl. V., figs. 11-16). Pleopod 1, exopod 1 with inner margin strongly curved, outer margin slightly sinuous and with spinous setae; endopod stout, turned outwards at tip and outer and inner margins towards apex with stout spines. Pleopod 2, exopod longer than broad, inner margin with fine setae, outer margin sinuous and with spinous setae; endopod, slender, styliform and reaching to tip of exopod. Exopods 3-5 triangular, progressively decreasing in size and with outer margin well supplied with spinous-setae. Endopods 3-5 subrectangular.

Uropod. Greatest width of peduncle slightly more than length of outer margin, outer margin grooved. Rami setose with tuft of apical setae; inner ramus slender, arising slightly anteriorly to outer and three-quarters its length.

Scale-setae of body tergites. These are of the tricuspid type (Pl. V., figs. 18 and 19). Except for the marginal scale-setae they are very much elongated; in both forms, however, the length is greater than the width of the base.

Remarks.

These specimens, identified by Chilton as *O. punctatus,* are presumably two of those collected during an expedition to the subantarctic islands of New Zealand. In recording these specimens from Auckland Island, Chilton remarked that they were quite the same as *O. punctatus,* a statement which an examination of external appearances would bear out, but a comparison of the appendages of *Ph. chiltoni* with Monod's figures of *Ph. punctatus* from Stewart Island shows considerable differences. Monod's figures do not agree altogether with Chilton's description in such details as the length of the joints of the flagellum of antenna 2 and the ratio of outer ramus: inner ramus of uropod. *Ph. chiltoni,* however, differs markedly from both descriptions in that the mandible is with two "free" penicils behind the setose lappet. It also differs from Chilton's account in that the joints of the flagellum of antenna 2 do not increase in length distally. *Ph. chiltoni* differs from *Ph. punctatus* as figured by Monod in maxilla 1 (the second of the innermost teeth being represented by that author as simple), in the endopodite of the first male pleopod and in the scale-setae (those figured by Monod are very much shorter than those of *Ph. chiltoni*). The most important of these characters is the form of the endopodite of the first male pleopod, which character is regarded as of specific value in other genera.

Through the kindness of Professor Benham of the University of Otago, Dunedin, an examination of specimens of *Ph. punctatus* (G.M.T.) collected by Thomson in the neighbourhood of Dunedin (the type locality) was later made possible.

In general appearance these specimens closely resemble *Ph. chiltoni*. Even the flagellum of antenna 2 corresponds very well, for the first and second joints are subequal rather than progressively longer. In the cephalon, however, the lateral lobes are better developed in *Ph. punctatus* than in *Ph. chiltoni*. In *Ph. punctatus* the frontal line of the cephalon is distinct in the middle. Mandibles are with a single "free" penicil behind the setose lappet. Five of the inner teeth of outer lobe of maxilla 1 more distinctly denticulate than in *Ph. chiltoni*; outer margin of inner lobe produced into a spine-like projection which is apparently a normal feature, though not represented by Monod. In maxilla 2 (Pl. V., fig. 22) only the upper half of the inner lobe is with stout setae along the margin. The scale-setae (Pl. V., figs. 23 and 24), as figured by Monod, differ from those of *Ph. chiltoni* in that the width of the base is greater than the total length. Unfortunately all the specimens are female and the uropods missing.

Phalloniscus kenepurensis (Chilton).

1901. *Oniscus kenepurensis*. Chilton. Trans. Linn. Soc. Lond. Zool., Vol. 8, p. 135.

Occurrence: Stephens Island, New Zealand.

These specimens differ slightly from Chilton's description in that the eyes consist of more than 15 ocelli; the lateral lobes are not very small as compared with other species and the epimera of the seventh mesosomatic segment reach as far back as two-thirds the length of the epimeral portion of the third metasomatic segment, whereas they are described as extending to the end of it. These differences are, however, comparatively trivial, and may be individual variations. Below are added other details not previously recorded.

Cephalon (Pl. VI., figs. 2 and 3).—Comparatively small, deeply sunk into the first mesosomatic segment, and wider than long. Frontal line distinct, and produced in front of the eyes into upwardly projecting, moderately large subacute lobes. These lobes are developed to a greater extent than in any of the other species examined. Frontal line depressed mesially. Marginal line passes obliquely across pleural portion of the cephalon and above antennary tubercle turns towards the supra-antennal line. Supra-antennal line slightly sinuous between antennary sockets and separated from their upper borders. Clypeus protuberant, with moderately large lateral processes. Profrons rounded. Postfrons with a small rounded prominence medianly. Eyes laterally placed and moderate in size, consisting each of 20-21 ocelli.

Appendages.

Antennule of three joints; the first broader and longer than the second, third still narrower, but approximately equal in length to the first and set with stout setae at apex and along mesial border.

Mandibles.—In the male both mandibles are normal; the right mandible is with one penicil on the setose lappet and one "free" penicil behind the

lappet. The outer margin is provided distally with spines. In the single female available, a quite unusual condition was found in the right mandible where a second penicil occurs on the setose lappet just beneath the setose area. The presence of this additional penicil is a notable deviation from the diagnosis of the family Oniscidae.

Maxilla 1.—Outer lobe (Pl. VI., fig. 7) with 4 + 6 teeth and 2 spines at apex; outer margin sinuous and densely furnished with setae distally. Of the 6 inner teeth some show the merest trace of denticulation, whilst others are simple; fifth tooth short, slender and simple; inner spine more slender and longer than outer. Inner lobe (Pl. VI., fig. 8) with two moderately long plumose setae; outer margin with inconspicuous spine-like projection.

Maxilla 2 (Pl. VI., fig. 9) has the usual platelike structure. Inner lobe very much smaller than outer, and covered with a furry coating of setae; upper two-thirds of margin also with a row of still stouter setae. Outer lobe covered subapically with fine setae, and with apical margin flattened.

Maxilliped (Pl. VI., fig. 10).—Endite with one spine and three teeth, of which the middle is conspicuous and strongly curved; inner surface of endite with a small group of setae towards its inner margin. In endopodite all three joints distinct, in which respect it differs from *Ph. chiltoni.*

Peraeopods.—In the male, merus and carpus densely fringed with spinous setae of the type found in *Ph. chiltoni.* These joints in the female, but sparsely setose.

Plepods (Pl. VI., figs. 11-16).—Expods of male similar to those of *Ph. chiltoni,* and bear the same type of spinous setae along the outer margin. Inner margins with a band of fine hair-like setae. Endopodite stout, and turned outwards at tip, but differing from *Ph. chiltoni* in that the apex is produced into a knob-like projection, on which are borne a number of denticles arranged in rows. Endopodite of pleopod 2 styliform, and those of pleopods 3-5 subrectangular in outline.

In the female exopod of pleopod 1 differs from those of pleopods 2-5 for the upper margin is strongly convex; outer margin slightly concave. Exopods 2 and 3 with outline subrectangular and apices scarcely produced. In the posterior exopods the apices are more produced, exopod 5 being subtriangular. Inner margins of all fringed with short fine setae and outer margins in addition with spinous setae.

Uropods (Pl. VI., fig. 17) covered with scale-setae similar to those of tergites. Peduncle grooved along outer margin. Inner ramus slender, arising slightly in front of and extending to the middle of the outer; surface set with scale-setae, whilst its inner margin is densely fringed with setae of a different type. Apex with two or three longer setae. Outer ramus stout, and with apical tuft of setae.

Scale-setae of the tricuspid type (Pl. VI., fig. 18).—These appear to be intermediate between those of *Ph. chiltoni* and *Ph. punctatus,* the greatest width being approximately equal to the length.

Remarks.

Ph. kenepurensis may, therefore, be distinguished readily from *Ph. punctatus* and *Ph. chiltoni* by the form of the lateral lobes of the cephalon and the endopodite of the first male pleopod, as well as by details of the mouth appendages.[1]

The two specimens referred to, *Phalloniscus punctatus,* and belonging to the Hamburg Museum, were collected by Chilton and identified by Budde-Lund. Since the specimens differ in several details from *Ph. punctatus* (G.M.T.) from Dunedin and from Monod's figures of that species from Stewart Island, a new species is therefore necessary for their reception.

Phalloniscus armatus n. sp.

(Pl. VIII., figs. 19-24.)

(*Phalloniscus punctatus,* det. Budde-Lund (non G.M.T.).)

Occurrence—Canterbury, New Zealand (2 specimens (cotypes) in Hamburg Museum and 8 specimens in Australian Museum).

Size—(Hamburg Museum specimens): The female specimen measures 8.5 mms. in length and 4 mms. in width. The male specimen was smaller in size.

Colour.—Mottled brown and yellowish-white. A lightish line runs along the median line of the mesosome, whilst another, in the four anterior segments, marks the junction of tergite and epimera.

Specific description.

Body, oblong-oval in shape, the length being a little more than twice the breadth. Dorsal surface covered with setae.

Cephalon differs from that of *Ph. punctatus* (Dunedin) in that the lateral lobes are better developed, approaching more nearly the condition found in *Ph. kenepurensis,* and in that the frontal line is not distinct in the middle.

Eyes lateral in position, and consisting each of 16-17 ocelli (eyes of *Ph. punctatus* with 20 ocelli).

Mesosome: Epimera moderately well developed, those of the first segment being produced anteriorly into rounded lobes, posterior angles of segment 1 rounded, whilst those of 2 and 3 are subrectangular. Posterior margins of anterior 3 segments slightly sinuous. Posterior margins of remaining 4 segments produced progressively more and more backwards to end acutely. Epimera of 7th segment reach to the middle of the epimeral portion of the third metasomatic segment.

Metasome: Anterior two segments wholly embraced by mesosome. Epimera of segments 3-5 well developed, those of the fifth reaching to the apex of terminal segment.

Terminal piece, short, triangular, sides slightly sinuous, and apex bluntly rounded.

1. The collection of the Australian Museum, Sydney, contains several specimens of *Ph. kenepurensis* which were collected from the type locality, Kenepuru, New Zealand. These specimens differ from Chilton's description and agree with the specimens from Stephens Island in the eyes, length of the seventh mesosomatic segment and the size of the lateral lobes. The mandibles in a female specimen examined were quite normal and not as in the Stephens Island specimen. The condition of the endopodite of the first male pleopod was constant.

Appendages.

Antenna 2 missing from male co-type. In the female the flagellum of the right antenna 2 is peculiar in that it is biarticulate, whilst the left is triarticulate. In the normal flagellum the first and second joints are subequal, and the third longer than their combined lengths. (In the Australian Museum material the flagella were normal.)

Left mandible: Outer cutting edge strongly chitinised and composed of 4 teeth, inner cutting edge as strongly chitinised, but indefinitely divided into teeth. Setose lappet with 2 penicils. A single "free" penicil between the setose lappet and the molar penicil; molar penicil consists of a tuft of plumose setae.

Right mandible differs from left in that the inner cutting edge is not as strongly chitinised, and in that setose lappet is with a single penicil.

Maxilla 1: Outer lobe with a dense fringe of fine setae along the distal portion of the outer margin, and with 4 + 6 setae and two spines at the apex. The inner six teeth are almost simple, there being only the merest trace of denticulation (cf. *Ph. kenepurensis*). Inner lobe with outer margin produced into a spine-like projection, the two plumose setae moderately long.

Maxilla 2 and maxilliped as in *Ph. punctatus.*

Peraeopods not noticeably unlike those of the other New Zealand forms.

Pleopods: The only distinct difference is in the first male pleopod, the endopodite of which is beset apically with denticles. This condition of the endopodite of the first male pleopod was also constant in the Australian Museum specimens.

Uropods: Peduncle reaching beyond terminal segment, and with the outer margin grooved. Outer ramus tapering to a point which bears an apical tuft of setae. Inner ramus slender, half the length of outer, and with a row of long setae along the inner margin (cf. *Ph. kenepurensis*), and with two stout setae at apex.

Scale-setae differ from those of *Ph. punctatus* in that the scale portion is more expended. Those along the margin of the tergite are with the scale portions projecting beyond the margin, and usually overlapping each other, but in some instances they are only touching. These scale setae would probably produce the scale-like markings to which Chilton referred.

Remarks.

These specimens differ markedly from the other New Zealand forms in the conditions of the 1st male pleopod endopodite, and in the form of the scale-setae, and thus justify the erection of a new species.

Phalloniscus (*Hanoniscus*) *tuberculatus* (Budde-Lund).[1]

(Pl. VIII., Figs 1-12.)

1912. *Hanoniscus tuberculatus* Budde-Lund, F.S.W. Taf. 1, figs. 14-20 and text fig. 26.

1922. *Phalloniscus punctatus* Wahrberg (non G.M.T.), Ark. Zool. XV., p. 91.

1 The description of this species is brief and frequent reference is made to *Ph.* (*H*) *nichollsi.* This is due to the fact that *Ph.* (*H*) *nichollsi* was intended to be the type species of the West Australian sub-genus, before it was realised that one of the species of the sub-genus was identical with *Hanoniscus tuberculatus* B-L.

Occurrence: 1. Tambellup.
2. Crawley, Perth.
3. Cannington. (Specimens in collection of Hamburg Museum.)
4. South Perth.

The Tambellup specimens were collected by Professor Nicholls in damp soil along the banks of the Gordon River in 1925. The Crawley specimens were collected from under decaying sacks on the edge of a swamp which exists on a peninsula (Pelican Point) projecting into the Swan River. The estuary is tidal and water strongly salt except during the rainy season. *Ph. (H) tuberculatus* was found in association with *Philoscia (Laevophiloscia) perlata*. The Cannington specimens were collected by the Michaelsen and Hartmeyer Expedition in 1905.

Size: The largest female (Crawley specimens) was approximately 9 mms. in length and 3 mms. in width, although the majority were smaller (about 6 mms. in length).

Colour: When alive the specimens were uniformly slaty-grey but after preservation a definite pattern became more obvious. The background is dark brown whilst the markings are whitish. The cephalon is irregularly marked. On the mesosome the light markings are arranged as a number of fine wavy lines forming two longitudinal bands, one on each side of the median line. On the posterior six segments of the mesosome there is a patch placed obliquely across the region of junction of tergite with epimeron. Towards the posterior angle of the epimeron there is another lightish patch. On the metasome the longitudinal bands of the mesosome are continuous as a series of light patches which are also carried on to the terminal segment. There is another light patch at the junction of tergite with epimeron. Running the entire length of the body is a faint median line. The legs are not as densely mottled as in *Ph. (H.) nichollsi*.

Specific description: Body, oblong-oval in shape; twice as broad as it is long and slightly convex. It is to be noted that it is not as convex as *Ph. (H) nichollsi*. The dorsal surface is granulated and with a slight wrinkling on the anterior mesosomatic segments.

Cephalon is of a similar type to that of *Ph. (H) nichollsi* but differs slightly in detail. As in that species the frontal line is obvious only at the sides where it is produced into narrow upward projecting lateral lobes. These lobes when seen from in front appear acute, whereas in *Ph. (H.) nichollsi* they are more obtuse. The hind margin of the head is more evenly rounded. The profrons although bulbous is not as prominent and differs in that it is rounded and not acute when seen from above, not being so deeply excavated above the antennal sockets.

Mesosome. Epimera of first mesosomatic segment produced anteriorly into lobes which are a little more acute than in *Ph. (H) nichollsi*. Posterior angles of the epimera and the posterior margins of the segments as described for *Ph. (H) nichollsi*. Epimera of the seventh mesosomatic segment only reach to the level of the middle of the epimeral portion of the third metasomatic segment.

Metasome comparatively short, being approximately two-fifths the length of the mesosome. Segments increase in length posteriorly and epimera of segments 3-5 moderately developed. Epimera of the fifth metasomatic segment do not extend to the tip of the terminal segment.

Terminal piece short, triangular in shape and almost two and one-half times as broad as it is long. The length varies somewhat, the rounded apex usually reaching a little beyond the distal margin of the peduncle of the uropods. The sides of this segment appear noticeably sinuous, due to the fact that the terminal portion is slightly depressed.

Appendages: Antenna 1 is extremely minute. First joint wider and longer than second; third narrower but only slightly longer than second; first longer than third. Distal joint is produced into a short apical spine and is armed apically and along the inner border with setae.

Antenna 2. Peduncle as in *Ph.* (*H*) *nichollsi*. As in that species an examination of a number of specimens collected from the same locality established that it was impossible to derive a constant ratio for the joints of the flagellum.* The distal joint was followed by the usual styliform bristle.

Specimen.	Ratio of joints of flagellum.	
A	1:2:3	1.4:1:1.75
B	1:2:3	1 :1:1.5
C	1:2:3	1.2:1:1.4
D	1:2:3	1.4:1:2
E	1:2:3	1.4:1:1.3
F	1:2:3	1.1:1:1.3
G	1:2:3	1.2:1:1.3

Mouth parts as described for *Ph.* (*H*) *nichollsi*.

Peraeopods differ from those described for *Ph.* (*H*) *nichollsi* in that the merus and carpus of the male specimens are not thickly clad with spines along the inner border.

Of 171 examples of the present species which were collected at one time at Crawley 86 were males. Although these were of varying sizes they all exhibited the less strongly spinose condition of the merus and carpus. The legs of the male, therefore, do not differ markedly from those of the female. Three weeks later 60 specimens were collected, 30 of which were males. The legs of these males exhibited the same condition as in the previous case.

Pleopods. In the pleopods the exopods of both male and female are as described for *Ph.* (*H*) *nichollsi*. The endopodite of the first male pleopod differs in form from that of *Ph.* (*H*) *nichollsi* in that it is more slender and without tooth-like projections along the outer distal margin.

Uropods. These are similar to those of *Ph.* (*H*) *nichollsi*.

Scale-setae. The scale-setae of this species are rounded apically but not dilated to the extent of those in *Ph.* (*H.*) *nichollsi*. As in *Ph.* (*H.*) *nichollsi* towards the posterior angle of the mesosomatic segments an elongated seta is to be found; in this species it is seen to be placed in the centre of the lightish spot described as occurring towards the posterior angle.

Remarks: This species can be readily distinguished from *Ph.* (*H*) *nichollsi* by the form of the head and terminal segment, by the markings on the dorsal surface of the body and the sparsely spinose condition of the anterior male legs.

Budde-Lund's type material must have been either from Cannington or from South Perth. It is of interest that Cannington lies in a swamp zone, that the Crawley specimens of *Ph.* (*H*) *tuberculatus* (B-L) and the 2 specimens which Wahrberg assigned to *Ph. punctatus* (here identified as *Ph.* (*H*)

* In the majority of specimens $1>2<3$ and $1<3$, but in others $1=2$, whilst in the largest female $1>3$.

tuberculatus (B-L), were collected from swamp areas. Budde-Lund's South Perth specimens were not included in the material sent from the Hamburg Museum, so a search was made in the swamps at Mill Point, South Perth. This search revealed specimens identical with *Ph. (H) tuberculatus* of Cannington. These specimens were found amongst the roots of plants and beneath decaying sacks.

Phalloniscus (Hanoniscus) nichollsi n. sp.

(Pl. VII., figs. 1-27.)

Occurrence—

1. Nornalup (Frankland River).
2. Nornalup (Walpole Inlet).
3. Bunbury (Hamburg Museum material).

This species was collected by Professor G. E. Nicholls (after whom it is named) from under karri logs in the valley of the Frankland River in November, 1925. Specimens were also taken by the author in January, 1933, from under fallen karri logs found on the hill slopes of Walpole Inlet. Only a few specimens were found, although there was an abundance of *Philoscia (Laevophiloscia) perlata* under the same logs.

Size: The larger specimens are approximately 7.5 mms. in length and 3 mms. in width.

Colour: When alive the specimens appear uniformly slaty-grey in colour but after preservation in spirit a more or less definite pattern becomes visible. In the male, the background is a dark brown and the markings of yellowish white. These lighter markings are arranged on the thorax, in two longitudinal bands of fine wavy lines on either side of the median line and on all but the first of the mesosomatic segments as a series of patches at the junction of epimera with tergites. On the metasome the patches are small and irregularly scattered. The cephalon is dark brown mottled with yellowish-white. In some of the females the pattern is as described for the males but in the majority of cases it is not as definite, the different regions being but faintly marked. For the dark brown of the male is substituted a reddish-brown in the female. In some of the smaller female specimens the body is mottled reddish-brown and yellowish-white. The peraeopods in both sexes are mottled brown and yellowish-white.

Specific description: Body (Pl. VII., fig. 1) oblong-oval in shape, slightly convex, approximately two and one-half times as long as it is broad, the convexity being more pronounced in the female specimens which are with young in the brood pouch.

Cephalon (Pl. VII., figs. 2 and 3) small, much broader than long and slightly wrinkled on the dorsal surface. Clypeus protuberant, but not quite so distinctly marked off from the face as the figure suggests, lateral processes moderately large. Frontal line ill defined in the middle region. Antennary tubercle very much reduced and lateral in position. Postfrons not distinctly separated from the profrons, owing to the absence of the middle region of the supra antennal line. Profrons not distinctly marked off from the vertex as frontal line is not obvious except in front and slightly to the inner side of the eye, where it runs along a tubercle-like lateral lobe. Profrons bulbous being produced into an eminence which, when viewed from above, appears to be sub-acute; profrons may be distinguished readily from

the vertex since it is densely pigmented. Marginal line forms hind margin of head; it is well defined laterally and after passing along the hind margin of the eye, runs obliquely across the pleural portion of the cephalon. Following Budde-Lund's terminology, the head is of the "discrete" type.

Eyes lateral in position and moderate in size, each consisting approximately of 20 ocelli.

Mesosome. Epimera of first mesosomatic segment produced anteriorly into subacute lobes reaching to a little in front of the hind margin of the eyes; posterior angles rounded. Posterior angles of epimera of segments 2 and 3 subquadrate. Posterior margins of anterior three segments slightly sinuous. Posterior margins of remaining segments more obviously sinuous and epimera produced progressively more and more backwards to end acutely. Epimera of segment 7 reach as far back as two-thirds the length of the epimeral portion of the third metasomatic segment.

Metasome (Pl. VII., fig. 4) short, being from one-third to one-quarter the length of the mesosome. Segments 1 and 2 sub-equal in length; segments 3-5 progressively longer. First two segments wholly embraced by the last mesosomatic segment. Epimera of segments 3-5 well developed, narrow, acute and recurved backwards. The ratio, length of epimeron: length of segment was not constant. Epimera of segment 5 extend almost to the level of the apex of the terminal segment.

Terminal segment (Pl. VII., fig. 5) short, triangular in shape and two and one-half times as broad as it is long, its apex, which reaches a little beyond the distal margin of peduncle of uropod, rounded, its lateral margins sinuous.

Appendages.

Antenna 1 extremely minute but relatively stout. First joint wider and longer than second; third joint longer and narrower than the second and with setae along the mesial border and at the apex.

Antenna 2. Peduncle of five joints; first joint short, second and third joints subequal, fourth longer than either second or third, and fifth approximately equal to the third and fourth joints combined. All the joints of the peduncle are covered with short spinous setae. The three joints of the flagellum (Pl. VII., fig. 6) together approximately equal to the length of the fifth joint of the peduncle. Wahrberg in describing what he identified as *Ph. punctatus* from Dongarra gave a definite ratio of the length of the joints of the flagellum. In the present species the examination of a number of specimens has shown that the ratio is quite inconstant and altogether useless for systematic purposes. In general, first and second joints subequal (the first may be shorter than the second) and the third from one and one-half to twice the length of first. Third joint followed by the usual styliform bristle which branches at the apex to form a compact penicil. The spinous setae of the flagellum are longer than those of the peduncle.

Right mandible (Pl. VII., fig. 7) has outer cutting edge strongly chitinised and composed of four rather indefinite teeth. Inner cutting edge not as strongly chitinised and even less definitely divided into teeth. Setose lappet beneath inner cutting edge with one penicil. A single "free" penicil occurs between the setose lappet and the molar penicil. Molar penicil consists of a tuft of plumose setae. Lateral surface of mandible with scattered bifid spines as figured.

Left mandible (Pl. VII., fig. 8) with outer cutting edge composed of four teeth. Inner cutting edge as strongly chitinised as outer. Setose lappet with two penicils; a single "free" penicil between lappet and molar penicil. Outer margin of body with scattered bifid spines.

Maxilla 1. External margin of outer lobe sinuous and fringed distally with fine setae. Apex of outer lobe (Pl. VII., fig. 9), with 4 + 6 teeth (outer 4 teeth more strongly chitinised than inner 6) and 2 spines (close to the shortest of the outer teeth). Five of the inner group distinctly bifid or occasionally trifid; fifth tooth slender and simple. Inner spine elongated. Inner lobe (Pl. VII., fig. 10) delicate and with moderately long plumose setae; outer edge produced into a spine-like projection, outer margin distally with a number of fine setae.

Maxilla 2 is a delicate plate-like structure incompletely divided into lobes. Inner lobe narrower than outer and with two types of setae; fine setae completely covering the lobe and a row of stouter setae along the margin. Outer lobe covered distally with fine setae, apical margin curved. Three stout setae occur at junction of outer and inner lobes.

Maxilliped. Basal joint broad and rectangular. Basipodite elongated and with short spinous setae. Only first joint of endopodite well defined; endopodite with a tuft of setae in the a-position, a group in the b-position, two or three in the c-position, two small setae along the outer margin and two stout spines on the first joint. Endite with a single prominent spine and three short teeth, one towards the inner margin and two near the outer corner; a group of setae on the inner surface. Epipodite approximately two-thirds the length of the basal joints.

Peraeopods. Those of the female practically all similar in structure, increasing slightly in length posteriorly. Basipodite elongated and rectangular in shape, ischium subtriangular; merus and carpus subrectangular (the carpus of the first leg differs, however, a little in shape from the same joint in the following legs, being broader and not so elongated in form); propod slender; dactyl, short, biunguiculate and with simple dactylar seta. The setae on the anterior legs, except for one borne on the distal margin of the carpus (Pl. VII. fig. 13), are similar to those found on the New Zealand forms.

In the male the legs 2-7 are similar in structure, the first differing from them in that, as in the female, the carpus is broader and less elongated than in the other legs. In the male, however, the merus and carpus are much more densely provided with spines than in the female. Monod, in figuring the legs of the male of *Ph. punctatus* from Stewart Island, shows that of the juvenile to be sparsely clad with spines along the inner margin. Of the ten males of *Ph. (H) nichollsi* collected nine were found to be densely clad with spines whilst the remaining example, which was very much smaller (2.5 mms.) than the others, a juvenile, was sparsely armed.

Pleopods (Pl. VII., figs. 15-25), in the female pleopod 1, exopodite differs slightly in shape from the remainder; outer margin concave, upper margin strongly curved. Exopods 2 and 3 subtriangular with apices slightly produced; in the posterior exopods the apices are more produced so that exopod 5 appears subtriangular. Inner margin of exopods fringed with very short fine setae and the outer with the typical spinous setae.

In the male pleopod 1, exopodite is of a different form from exopods 2-5; outer margin slightly concave and with spinous setae. Endopodite 1 produced into an elongated structure, turned outwards apically where the inner margin is produced into a minute lobe furnished with stout setae; the outer margin is set with a band of tooth-like projection. Pleopod 2 with apex of exopod produced; endopod styliform, tapering to a fine point. Exopods 3-5 subtriangular; inner margins of all fringed with short fine setae. Endopods 3-5 moderately developed and irregular in form.

Uropod (Pl. VII., fig. 26). Basal joint subquadrilateral; length along external margin slightly greater than the greatest width of peduncle; outer margin grooved. Outer ramus stout, pointed, grooved externally and with a tuft of setae at apex. Inner ramus inserted slightly anteriorly to outer, about half its length and flattened on its inner surface.

Scale-setae found covering the body tergites of dilated form (Pl. VII., fig. 27), similar to those figured by Wahrberg. Towards the posterior angles of the mesosomatic segments a conspicuous, elongated seta is to be found (cf. *Ph. kenepurensis*).

Phalloniscus (Hanoniscus) monodi n. sp.

1922, *Ph. kenepurensis*, Wahrberg (non Chilton), Ark. Zool. Bd., XV., p. 86.

Occurrence—

1. Wooroloo.
2. York. (Western Australian Museum specimen.)
3. Moora. (Stockholm Museum specimens.)

Examples were taken at Wooroloo (September, 1932) from under stones on the banks of a creek where the soil was permanently damp. Subsequently other specimens were collected from the same locality from under the bark of nearby trees.

A specimen, in the collection of the Western Australian Museum, collected by Michaelsen, at York, in 1905, apparently belongs to this species, whilst the specimens collected at Moora and referred to *Hanoniscus sp.* (F.S.W., 1912) are identical with this species.

Size—The larger specimens are 7 mms. in length and 3 mms. in width.

Colour—As in the other Western Australian species the specimens are a uniform slaty-grey. After preservation in spirit light brown markings on a dark brown background are distinguishable. These lighter markings on the thorax, whilst following the general plan of *Ph. (H) tuberculatus*, nevertheless form a quite distinct pattern. The light patch towards the posterior angle of the epimeron is minute. The metasome is almost completely dark brown, though sometimes there may be faint patches on the anterior three segments. Irregular light patches occur on the terminal segment. The underside is mottled.

Specific description.

Body, oblong-oval in shape, and much more flattened than is the case in *Ph. (H) tuberculatus*. Length of body a little more than twice the breadth Dorsal surface with wrinkled areas on the anterior segments, but, as in *Ph. (H) tuberculatus*, they are not markedly raised. Dorsal surface irregularly

granulated; the coarser granules are scattered over the mesosomatic segments, and also form continuous rows along the posterior margins. In the metasome the coarser granules are restricted in some of the specimens to the posterior margins of the segments.

Cephalon, approximately twice as broad as it is long, wrinkled on the dorsal surface and with a slightly raised crest along hind margin. Front margin, when seen from above, is bilobed as the cephalon is slightly depressed in the middle. Lateral lobes, small. The eminence into which the profrons is produced is rounded as in *Ph.* (*H*) *tuberculatus*. Margin of clypeus, to which labrum is attached, markedly concave.

Mesosome: Epimera of first segment produced anteriorly into subacute lobes which reach a little in front of the hind margins of the eyes. Posterior angles of the first segment, rounded, whilst those of the second and third are quadrate. Epimera of the seventh segment reach to the level of the middle of the epimeral portion of the third metasomatic segment.

Metasome short, approximately one-third the length of the mesosome. The metasome is shorter, in comparison to the length of the mesosome, than in *Ph.* (*H*) *tuberculatus*.

Terminal piece more bluntly rounded than in *Ph.* (*H*) *tuberculatus*. Apex not obviously depressed.

Appendages.

Antenna 1: First joint approximately equal to second and third joints combined; third joint slightly longer than second, produced distally into a spine-like projection, and with a number of stout setae.

Antenna 2: In the flagellum the first and third joints are subequal in length, whilst the second is shorter than either.

Mouth parts as described for *Ph.* (*H*) *nichollsi*.

Peraeopods as in *Ph.* (*H*) *tuberculatus*, *i.e.*, joints 4 and 5 of peraeopod sparsely setose in both male and female.

Pleopods as in *Ph.* (*H*) *tuberculatus*. The first male endopodite does not differ markedly from that of *Ph.* (*H*) *tuberculatus*.

Uropods as in the other Western Australian species.

Scale-setae are for the most part greatly dilated, though towards the anterior margins of the tergites narrower examples (more like those of *Ph.* (*H*) *tuberculatus*) are to be found in some instances.

Remarks.

This species may be distinguished from *Ph.* (*H*) *tuberculatus* by the colour pattern, the bluntly rounded terminal segment, the presence of coarse granules on the dorsal surface and the crest along the hind margin of the cephalon.

The single specimen from York (collected by Michaelsen and Hartmeyer) should be referred to this species with which it completely agrees, except for the condition of the maxilliped (the endite bears two spines and four teeth instead of the usual one spine and three teeth, whilst the first joint of the endopodite bears four instead of two spines) and not to *Phalloniscus* (*Hanoniscus*) *tuberculatus* (B.L.). It differs from the figures of *Hanoniscus tuberculatus* furnished by Budde-Lund (op., cit., Taf. 1, figs. 14-20, and text fig. 26), and from the other specimens which Budde-Lund referred to that species.

VII.—KEY TO THE SPECIES OF THE SUB-GENUS *HANONISCUS*.

1. (a) Merus and carpus of anterior male legs densely spinose .. .. .. *Ph. (H) nichollsi* n sp.
   (b) Merus and carpus of anterior male legs sparsely spinose 2

2. (a) Dorsal surface finely granulated .. .. .. *Ph. (H) tuberculatus* (Budde-Lund)
   (b) Dorsal surface coarsely granulated .. .. .. *Ph. (H) monodi* n. sp.

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IX.—EXPLANATION OF PLATES.

PLATE V.

Fig. 1.	**Phalloniscus chiltoni** n.sp.	.. Specimen (dorsal view).
Fig. 2.	„	.. Cephalon, from in front.
Fig. 3.	„	.. Antenna 2.
Fig. 4.	„	.. Left mandible, distal portion ("free" penicils and molar penicil bent).
Fig. 5.	„	.. Maxilla 1, distal portion of outer lobe.
Fig. 6.	„	.. Maxilla 1, distal portion of inner lobe.
Fig. 7.	„	.. Maxilla 2, distal portion.
Fig. 8.	„	.. Left maxilliped, distal portion.
Fig. 9.	„	.. 1st peraeopod, terminal segments.
Fig. 10.	„	.. Dactylus of 1st peraeopod, distal portion.
Fig. 11.	„	.. Pleopod 1, exopod. ♂
Fig. 12.	„	.. Pleopod 1, endopod. ♂
Fig. 13.	„	.. Pleopod 2. ♂
Fig. 14.	„	.. Pleopod 3. ♂
Fig. 15.	„	.. Pleopod 4. ♂
Fig. 16.	„	.. Pleopod 5. ♂
Fig. 17.	„	.. Uropod.
Fig. 18.	„	.. Scale-setae from thoracic tergite.
Fig. 19.	„	.. Scale-setae from edge of tergite.
Fig. 20.	Phalloniscus punctatus (G.M.T.)	.. Cephalon, dorsal view.
Fig. 21.	„	.. Maxilla 1, distal portion of inner lobe.
Fig. 22.	„	.. Maxilla 2, distal portion.
Fig. 23.	„	.. Scale-setae from edge of tergite.
Fig. 24.	„	.. Scale-setae from thoracic tergite.

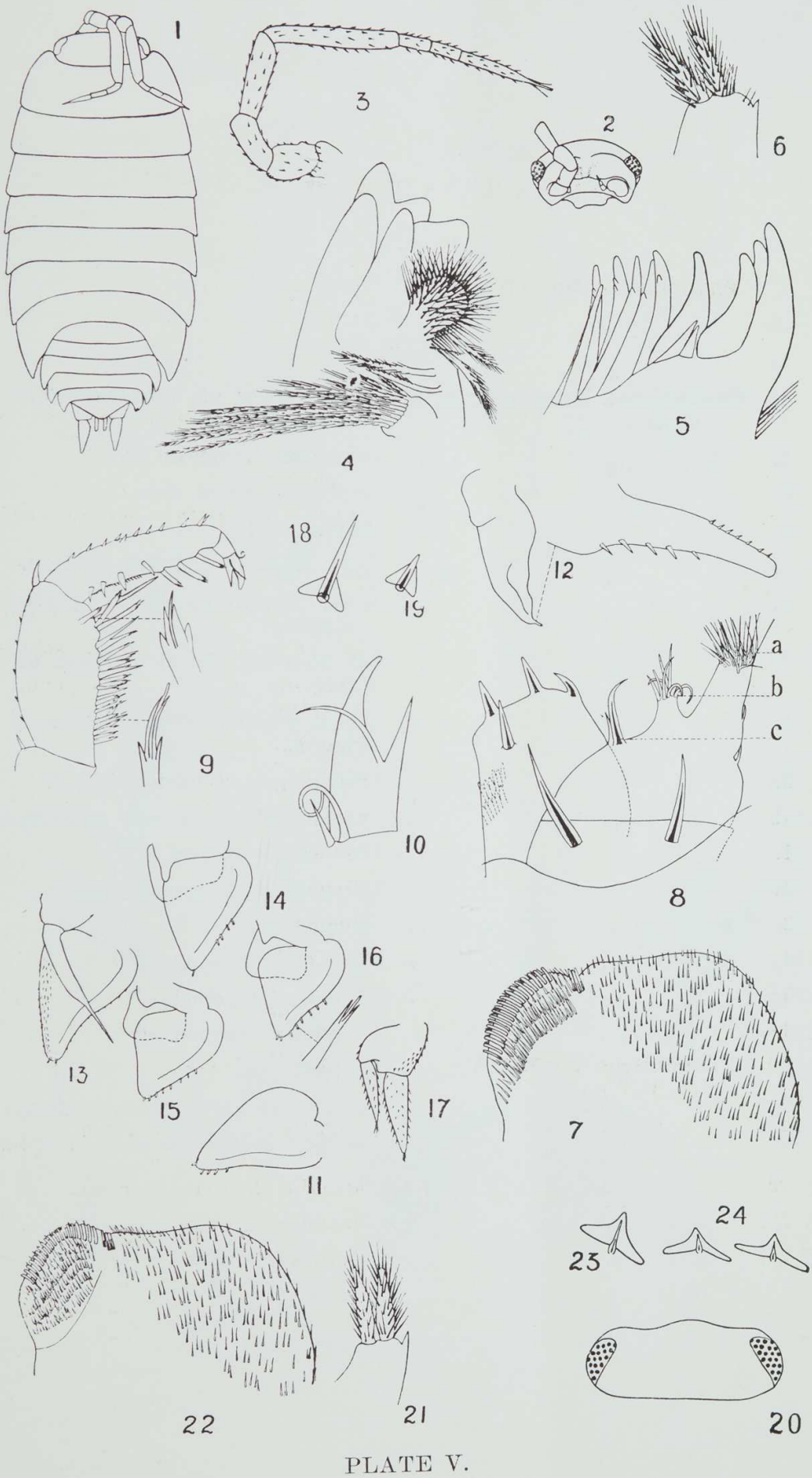

PLATE V.

PLATE VI.

Fig. 1.	**Phalloniscus kenepurensis** (Chilt.)	.. Dorsal view of mesosome and metasome. ♂
Fig. 2.	„	.. Cephalon, from in front.
Fig. 3.	„	.. Cephalon, from side.
Fig. 4.	„	.. Antenna 2.
Fig. 5.	„	.. Left mandible, distal portion.
Fig. 6.	„	.. Left mandible, distal portion enlarged.
Fig. 7.	„	.. 1st maxilla, distal portion of outer lobe.
Fig. 8.	„	.. Distal portion of inner lobe of maxilla 1.
Fig. 9.	„	.. Distal portion of maxilla 2.
Fig. 10.	„	.. Distal portion of left maxilliped.
Fig. 11.	„	.. Pleopod 1, exopod. ♂
Fig. 12.	„	.. Pleopod 1, endopod. ♂
Fig. 13.	„	.. Pleopod 2. ♂
Fig. 14.	„	.. Pleopod 3, exopod. ♂
Fig. 15.	„	.. Pleopod 4, exopod. ♂
Fig. 16.	„	.. Pleopod 5, exopod. ♂
Fig. 17.	„	.. Uropod.
Fig. 18.	„	.. Scale-setae from thoracic tergite.
Fig. 19.	„	.. Thoracic seta from edge of epimeron.

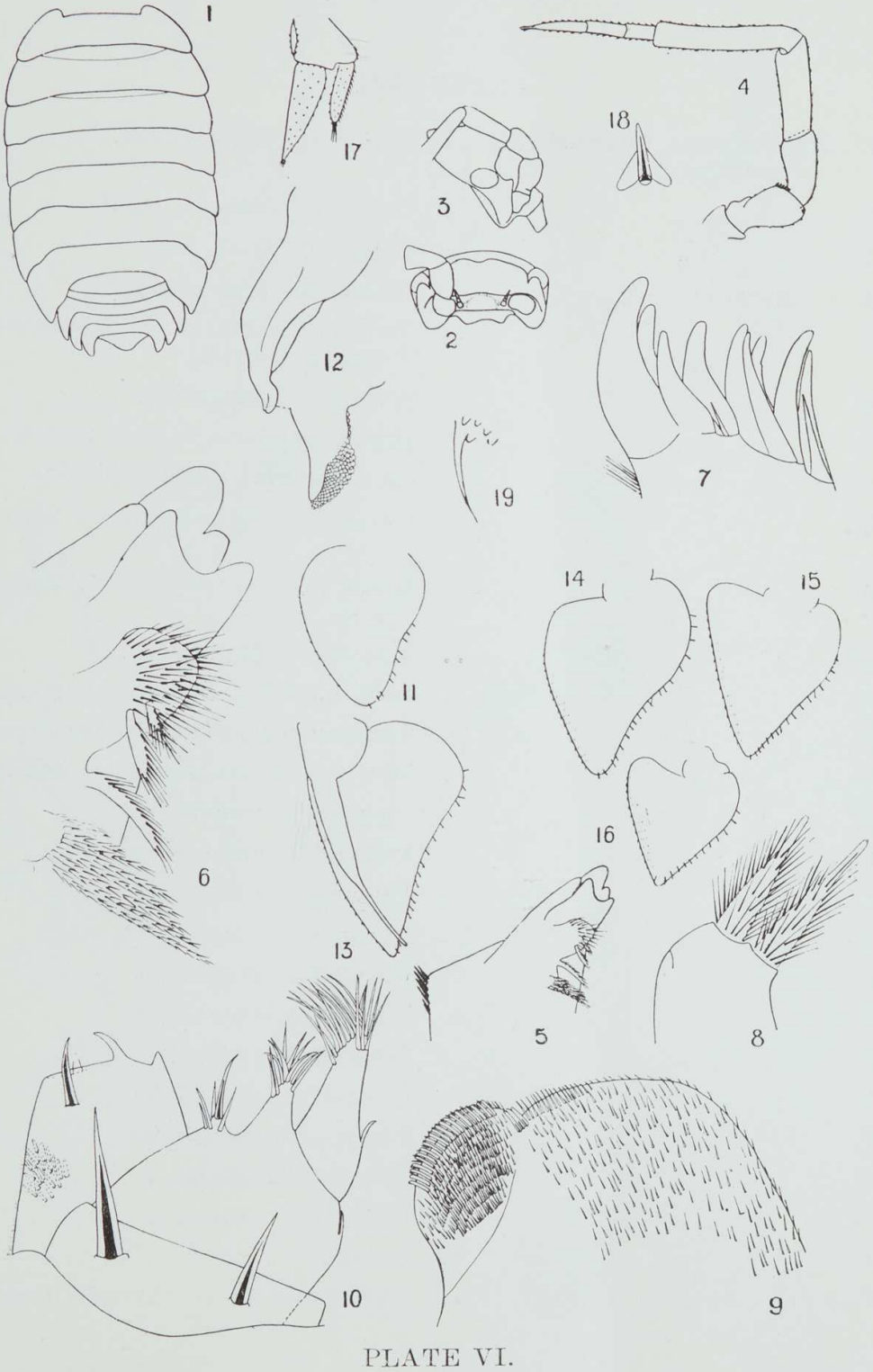

PLATE VI.

PLATE VII.

Fig. 1. **Phalloniscus (Hanoniscus) nichollsi** n.sp. .. Specimen, dorsal view.

Fig. 2. „ .. Cephalon, from in front.

Fig. 3. „ .. Cephalon, from side.

Fig. 4. „ .. Metasome (enlarged).

Fig. 5. „ .. Terminal segment of metasome further enlarged.

Fig. 6. „ .. Antenna 2, flagellum.

Fig. 7. „ .. Right mandible, distal portion.

Fig. 8. „ .. Left mandible, distal portion.

Fig. 9. „ .. Outer lobe of maxilla 1, distal portion.

Fig. 10. „ .. Inner lobe of maxilla 1, distal portion.

Fig. 11. „ .. Maxilla 2, distal portion.

Fig. 12. „ .. Left maxilliped, distal portion.

Fig. 13. „ .. Terminal segments of 1st peraeopod. ♂

Fig. 14. „ .. Dactylus of 1st peraeopod enlarged. ♂

Fig. 15. „ .. Pleopod 1, exopod. ♂

Fig. 16. „ .. Pleopod 1, endopod. ♂

Fig. 17. „ .. Pleopod 2, exopod. ♂

Fig. 18. „ .. Pleopod 3, exopod. ♂

Fig. 19. „ .. Pleopod 4, exopod. ♂

Fig. 20. „ .. Pleopod 5, exopod. ♂

Fig. 21. „ .. Pleopod 1, exopod. ♀

Fig. 22. „ .. Pleopod 2, exopod. ♀

Fig. 23. „ .. Pleopod 3, exopod. ♀

Fig. 24. „ .. Pleopod 4, exopod. ♀

Fig. 25. „ .. Pleopod 5, exopod. ♀

Fig. 26. „ .. Uropod.

Fig. 27. „ .. Scale-setae from thoracic tergites.

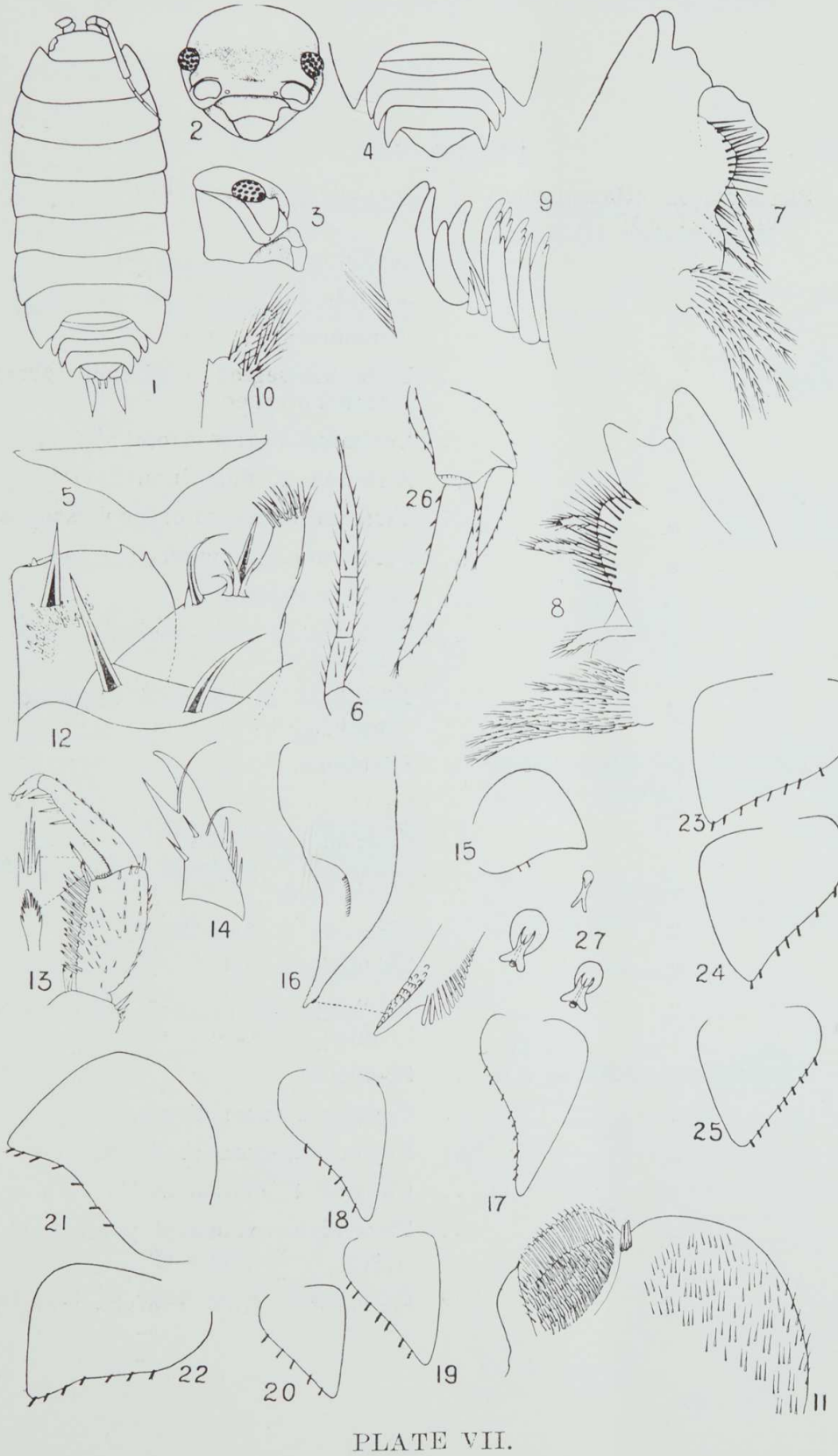

PLATE VII.

PLATE VIII.

Fig. 1.	**Phalloniscus (Hanoniscus) tuberculatus** (B-L.)	.. Specimen.
Fig. 2.	„	.. Metasome (enlarged).
Fig. 3.	„	.. Terminal segment of metasome mounted.
Figs. 4 and 5.	„	.. Two views of cephalon from in front.
Fig. 6.	„	.. Cephalon partly from above.
Fig. 7.	„	.. Antenna 2, flagellum.
Fig. 8.	„	.. Terminal segments of 1st peraeopod. ♂
Fig. 9.	„	.. Pleopod 1, endopod. ♂
Fig. 10.	„	.. Scale sculpture.
Fig. 11.	„	.. Scale setae from margin further enlarged.
Fig. 12.	„	.. Markings of thoracic segment (half only).
Fig. 13.	**Phalloniscus (Hanoniscus) monodi** n.sp.	.. Specimen.
Fig. 14.	„	.. Metasome (enlarged).
Fig. 15.	„	.. Terminal segment of metasome mounted.
Fig. 16.	„	.. Antenna 2, flagellum.
Fig. 17.	„	.. Scale-setae.
Fig. 18.	„	.. Markings of thoracic segment (half only).
Fig. 19.	**Phalloniscus armatus** n.sp.	.. Specimen.
Fig 20.	„	.. Cephalon, from above.
Fig. 21.	„	.. Cephalon, from in front.
Fig. 22.	„	.. Pleopod 1, endopod. ♂
Fig. 23.	„	.. Two views of distal portion of pleopod 1, endopod. ♂
Fig. 24.	„	.. Scale-setae from edge of tergite.

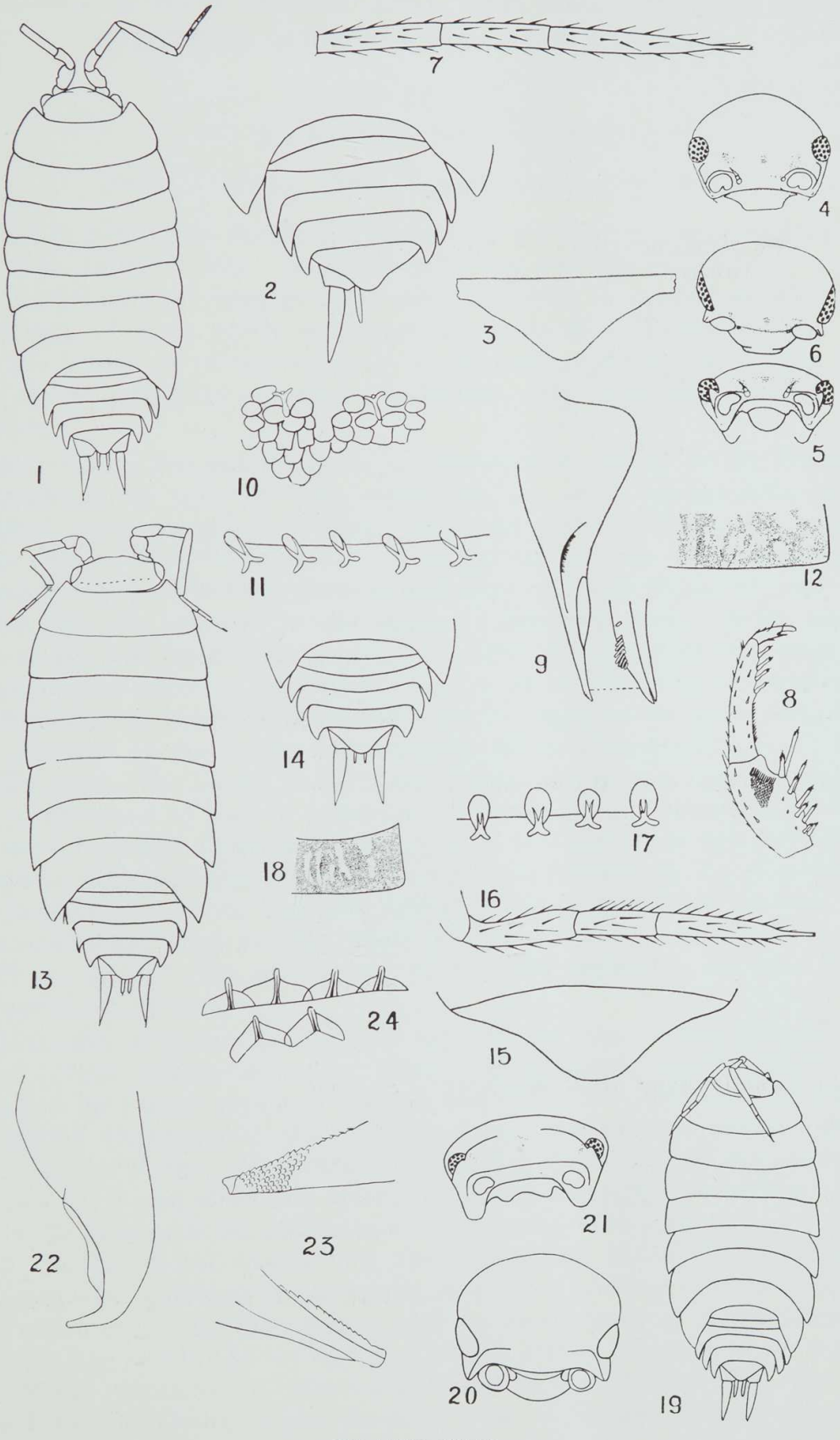

PLATE VIII.

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